

Responses to Anonymous Referee #3

Thank you for your helpful review. Please find our answers to each of your comments below.

General comment.

<<"This manuscript is about valuating risks for natural hazards, presenting a methodological proposal based on CVT. Case studies in peril suggest that the CVT-based variable-resolution exposure models proposed have a high efficiency in integrating large-area building portfolios to adequately estimate earthquake and tsunami losses. The topic of the paper fits the Journal well. Overall, I suggest the manuscript can be accepted after minor revisions in the following aspect:

This study is interesting, but in the revised version, the authors are suggested to provide more explanation about the novel points of this manuscript. Indeed I may miss something, but a clearer clarification may be better"

Thank you for your nice comments and your suggestions. It is very meaningful for us that you have perfectly highlighted the main goal of our study while at the same finding it interesting.

This work presents for the first time a first contribution to find an adequate balance in the resolution of the exposure model with the spatial resolution and variability of the hazard intensities for risk assessment. The necessity of this research topic had been already suggested by other experts in that area (i.e. by Douglas, 2007; Ordaz et al. 2019; Zuccaro et al. 2018). We found that CVT-based models adequate to be used in the aforementioned purpose. As explained in the paper, our method contrasts with the current state of the art related to building exposure modelling (aggregation) that neglects the variability of the hazard intensities in their derivation. Current approaches simply uses administrative boundaries for exposure aggregation and risk computation. Thus, we consider that developing this new paradigm and the subsequent sensitivity analyses performed are themselves innovative.

Although the former aspects are extensively described in the Introduction section of the paper, we make sure to emphasise this novelty in the new version of the manuscript. Thus, we also have made a clearer link between the current state of the art regard and the conclusion chapter. This list enumerates more exhaustively the main advantages of CVT-based models over the conventional approaches for exposure modelling and aggregation (administrative aggregation entities).

Moreover, we make use of the concept of inter-scheme conversion matrices to further prove their usefulness to derive exposure models (i.e. spatial distribution of building classes and replacement costs). This is novel because if we can know these characteristics for a single exposure scheme (e.g. seismic-oriented), we could get the same descriptors for another vulnerability scheme (e.g. tsunamis). This procedure ensures the comparability across the different schemes and this compatibility had not been considered so far in the related scientific literature for multi-hazard exposure modelling. This aspect also outlines that various exposure models existing in the literature can actually be complemented and compared in a probabilistic manner.

Another innovative idea: we test the proposed method over the residential building portfolio of an important megacity that has been strongly affected during non-instrumental times by earthquakes, and tsunamis. The importance of addressing such scenarios for Lima as well as the comparison of our results with the few existing scenarios for Lima may be of the interest of many readers interested by risk scenarios for this city.

Through this response we would also like to let you know that we have decided to provide the data models and scripts that we have constructed during the elaboration of our study. These models are supplementary data to the paper. They are assigned an independent DOI, and are accordingly cited in the new version of the manuscript. We consider that this is a transparent approach that could also benefit future readers who will be able to better understand, reuse and cite these datasets. An example can be found accessing the following link:

<https://dataservices.gfz-potsdam.de/panmetaworks/review/f932840b5c130da18c3a9d407e85f086ce0874b80edbd796e0f096ba94d89cc4/>

We also let you know that we asked an editor (a native English speaker) to provide us a strict language review. The new version has been significantly improved in that regard.

We sincerely thank the reviewer for the time invested in providing us the very constructive feedback and comments.

With best regards,

The team of authors.

References

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- Ordaz, M., Salgado-Gálvez Mario Andrés, Huerta Benjamín, Rodríguez Juan Carlos, Avelar Carlos, 2019. Considering the impacts of simultaneous perils: The challenges of integrating earthquake and tsunamigenic risk. *Disaster Prevention and Management: An International Journal* 28, 823–837. <https://doi.org/10.1108/DPM-09-2019-0295>
- Zuccaro, G., De Gregorio, D., Leone, M.F., 2018. Theoretical model for cascading effects analyses. *International Journal of Disaster Risk Reduction* 30, 199–215. <https://doi.org/10.1016/j.ijdrr.2018.04.019>